

## CURABLE ORGANOPOLYSILOXANE COMPOSITION

### BACKGROUND OF THE INVENTION

The present invention relates to a curable organopolysiloxane composition or, more particularly, to an organopolysiloxane composition curable into a gelled mass suitable as a potting and encapsulating agent, for example, for protecting various electric and electronic components from mechanical shocks and influences of the ambient atmosphere without the problem of oozing or bleeding of the oily constituents contained therein.

Organopolysiloxane compositions cured to have a gel-like consistency, referred to as a silicone gel herein-after, are widely used as a potting and encapsulating agent of various kinds of electric and electronic devices and components by virtue of their excellent electric properties such as insulation with stability and mechanical properties such as shockabsorbing power. For example, components of electronic circuits such as power transistors, integrated circuits, capacitors and the like are embedded in a silicon gel so as to be protected from mechanical shocks and thermal and corrosive influences of the outer atmosphere which would otherwise cause a damage on the component.

Organopolysiloxane compositions capable of giving a silicone gel are cured by a crosslinking reaction which proceeds by several different mechanisms. Most of the organopolysiloxane compositions to give a silicone gel utilize the so-called addition reaction or hydrosilation reaction between vinyl groups directly bonded to the silicon atoms in a first organopolysiloxane and hydrogen atoms directly bonded to the silicon atoms in a second organopolysiloxane or organo-hydrogenopolysiloxane in the presence of a platinum catalyst. Various formulations have been proposed in the prior art for the addition-curable organopolysiloxane-based silicone gel compositions with an object to obtain an adequately controlled gel-like consistency. For example, Japanese Patent Kokai 56-143241, 62-39659, 63-35655 and 63-33475 disclose a composition comprising a vinyl-containing organopolysiloxane and an organohydrogenopolysiloxane in such a proportion as to provide a relatively small amount or from 0.3 to 0.6 moles of the silicon-bonded hydrogen atoms in the organohydrogenopolysiloxane per mole of the vinyl groups in the vinyl-containing organopolysiloxane or a composition formulated with a vinyl-containing organopolysiloxane containing from 0.1 to 1.8 moles of the silicon-bonded vinyl groups per mole on an average.

These prior art organopolysiloxane compositions, however, have a problem in common that the oily constituents contained in the silicone gel obtained therefrom more or less subsequently bleed out of the surface or migrate toward a body embedded therein or in contact therewith. In the composition of the former type containing the silicon-bonded vinyl groups in an amount smaller than equimolar to the silicon-bonded hydrogen atoms, namely, the silicone gel obtained therefrom necessarily contains a considerable amount of the uncrosslinked organopolysiloxane which is responsible for the undesirable phenomenon of bleeding. In the composition of the latter type utilizing a vinyl-containing organopolysiloxane containing a relatively small amount of the silicon-bonded vinyl groups on an average, the organopolysiloxane as a product of the equilibrium reaction is a mixture containing molecular spe-

cies of the organopolysiloxane having no silicon-bonded vinyl groups and hence incapable of pertaining to the crosslinking reaction so that the silicone gel obtained from the composition always contains such as unreactive constituent responsible for bleeding. Once the phenomenon of bleeding has taken place, the bleeding oily matter badly contaminates the electric or electronic component in contact with the silicon gel to cause troubles of failure in the electric connection between contacting terminals and the like. When such a silicone gel is in contact with a part made from a silicon rubber, in addition, the oily matter bleeding out of the silicon gel acts as a swelling agent of the silicone rubber to cause volume expansion or deformation of the silicon rubber parts.

### SUMMARY OF THE INVENTION

The present invention accordingly has an object to provide an organopolysiloxane composition which is curable by crosslinking by the mechanism of the addition reaction to give a silicone gel free from the problem of bleeding of the oily matter contained therein.

Thus, the curable organopolysiloxane composition of the present invention comprises, as a uniform blend:

(A) a vinyl-containing organopolysiloxane which is a combination of

(A-1) from 1% to 99% by weight or, preferably, from 20% to 80% by weight of a first vinyl-containing diorganopolysiloxane having a viscosity in the range from 300 to 100,000 centipoise at 25° C. and represented by the general formula



in which Vi is a vinyl group, R is a substituted or unsubstituted monovalent hydrocarbon group free from aliphatic unsaturation having 1 to 10 carbon atoms and the subscript p is a positive integer, and

(A-2) from 99% to 1% by weight or, preferably, from 80% to 20% by weight of a second vinyl-containing diorganopolysiloxane having a viscosity in the range from 300 to 100,000 centipoise at 25° C. and represented by the general formula



in which Vi and R each have the same meaning as defined above, Me is a methyl group and the subscript q is a positive integer;

(B) an organohydrogenopolysiloxane represented by the average unit formula



in which R has the same meaning as defined above, the subscript a is a positive number not exceeding 3 and the subscript b is a positive number not exceeding 2 with the proviso that a+b is smaller than 4, and having at least three hydrogen atoms directly bonded to the silicon atoms in a molecule in an amount sufficient to provide from 0.8 to 2.0 moles of the hydrogen atoms directly bonded to the silicon atoms per mole of the vinyl groups in the component (A); and

(C) a catalytic amount of a compound of a metal selected from the group consisting of platinum, palladium and rhodium.

The above defined organopolysiloxane composition optionally, further comprises: